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ABSTRACT

The construct validity of children's responses to the Self Description Questionnaire, the Perceived Competence Scale for Children, and the Multidimensional Measure of Children's Perceptions of Control was assessed. The tests' authors emphasized the importance of distinguishing self-perceptions in the physical, social, academic, and general content domains. Tests of this content specificity included factor analyses, multitrait-multimethod (MTMM) analyses, and patterns of correlations with additional criterion variables. The subjects were 510 7th, 8th, and 9th graders (42% female) from two single-sex private high schools in Sydney, Australia. The subjects' motivation and mathematics and reading achievement were also studied. Contrary to previous research, MTMM analyses of responses to the two self-concept instruments demonstrated their convergent and discriminant validity, apparently reflecting the improved design of these newer instruments. These findings and factor analyses of responses to the self-concept instruments support claims by S. Harter (1982) and by H. W. Marsh. For the perceived control instrument, however, there was little support for the discriminant validity of responses with respect to content domains other than the physical domain, calling into question claims by J. P. Connell (1985). Seven tables summarize data. (Author/SLD)

Multidimensional Self-concepts and Perceptions of Control: Construct Validation of Responses By Children

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Multidimensional Self-concepts and Perceptions of Control: Construct Validation of Responses By Children

ABSTRACT

The purpose of the present investigation is to test the construct validity of children's responses to two multidimensional self-concept measures and a multidimensional measure of perceived control. The authors of each of these recently developed instruments emphasized the importance of distinguishing self-perceptions in the physical, social, academic and general content domains. Tests of this content specificity considered here included factor analyses, multitrait-multimethod (MTMM) analyses, and patterns of correlations with additional criterion variables. Contrary to previous research (e.g., Marx & Winne, 1978), MTMM analyses of responses to the two self-concept instruments demonstrated their convergent and discriminant validity, apparently reflecting the improved design of these newer instruments. These findings and factor analyses of responses to the self-concept instruments support claims by Harter (1982) and by Marsh (in press-b; 1986d). For the perceived control instrument, however, there was little support for the discriminant validity of responses with respect to content domains other than the physical domain, calling into question claims by Connell (1985).

Multidimensional Self-concepts and Perceptions of Control: Construct Validation of Responses By Children

The enhancement of self-concept and of perceived control are widely valued as a desirable outcomes and are frequently posited as intervening processes that may lead to other desirable changes. Furthermore, many researchers have posited a priori patterns of relations between these two constructs (e.g., Connell, 1985; Covington, 1984; Covington & Omelich, 1984; Fitch, 1970; Harter, 1983; 1985; Harter & Connell, 1984; Marsh, 1984). The purpose of the present investigation is to examine support for the construct validity of two multidimensional measures of self-concept and a multidimensional measure of perceived control designed to be used by children.

Self-concept and perceived control are frequently posited to be multidimensional in that they are specific to particular domains (e.g., physical, social, and academic). Until recently, however, researchers have emphasized global measures of both these constructs, and support for their multidimensionality was limited. Early factor analytic studies of both self-concept (e.g., Coopersmith, 1967) and locus of control (e.g., Rotter, 1966; 1975) failed to identify domain specific factors. Similarly, attempts to establish the divergent validity of domain specific measures of these constructs were typically unsuccessful. Marx and Winne (1978; Winne, Marx & Taylor, 1977), for example, classified the scales from various self-concept instruments into physical, social and academic domains. In their classic multitrait-multimethod (MTMM) studies, they found support for convergent validity but not divergent validity. That is, responses to different instruments did not consistently differentiate between the physical, social and academic domains. Similarly, in their review of perceived control, Stipek and Weisz (1981) posited that academic outcome variables should be more highly correlated with academic specific measures of perceived control than general measures of perceived control. They, however, were also unable to find support for this domain specificity. These findings suggested, perhaps, that these constructs were not domain specific. Alternatively, as suggested by subsequent research, the lack of support for the multidimensionality of both self-concept and perceived control in this early research may have represented limitations in theoretical models and instruments used in each area of research.

Multidimensional Self-concepts

The Shavelson Model

Until recently, systematic reviews of self-concept research emphasized the inadequate theoretical models, the unmanageable array of instruments used to infer the construct, limitations in the quality of these instruments, and methodological shortcomings in self-concept research (e.g., Burns, 1979; Shavelson, Hubner & Stanton, 1976; Wells & Marwell, 1976; Wylie, 1974; 1979). In an attempt to remedy some of these problems, Shavelson et al. posited a multifaceted, hierarchical model of self-concept. Shavelson proposed a general self-concept defined by academic and nonacademic self-concepts; academic self-concept was divided into self-concepts in particular content areas (e.g., English and mathematics); nonacademic self-concept was divided into social, physical and emotional self-concepts. Physical self-concept was further divided into self-concepts of physical ability and physical appearance whereas social self-concept was divided into peer relations and relations with significant others. By positing this hierarchical model, Shavelson et al. emphasized the domain specificity of self-concept while still recognizing a general construct (also see Marsh, 1986b). Harter (1982, 1983) also addressed many of these issues in her review of self-concept theory and research. In particular, based in part on Rosenberg (1979), she also argued for the need to consider both domain specific components and a general, superordinate component of self.

At the time Shavelson, et. al. posited their model there was little empirical support for it. Whereas numerous factor analytic studies reported multiple factors, these factors were typically difficult to interpret, unreplicable, or not clearly related to the scales that an instrument was intended to measure. Furthermore, MTMM analyses offered little support for the divergent validity of the domain specific scales (e.g., Marx & Winne, 1978; Winne, Marx & Taylor, 1977). In dramatic contrast, more recent empirical research (Byrne, 1984; Byrne & Shavelson, 1986; Dusek & Flaherty, 1981; Fleming & Courtney, 1984; Harter, 1982; Marsh, Barnes & Hocevar, 1985; Marsh & Hocevar, 1985; Marsh & Shavelson, 1985; Soares & Soares, 1982; Song & Hattie, 1985) has found clear support for the multidimensionality of self-concept. The difference is apparently due to changes in the design of self-concept instruments. Early instruments typically consisted of a hodge-podge of self-related items and exploratory factor analysis was used to search for the salient factors with limited success. Current instruments are typically designed to measure a priori factors that are at least implicitly based on models such as posited by Shavelson, and factor analysis is used to refine and confirm these a priori factors.

Two Newly Developed Self-concept Instruments

<u>The Self Description Questionnaire (SDQ).</u> Research with the SDQ, an instrument based on the Shavelson model, provides strong support for the multidimensionality of self-concept, and particularly for the Shavelson model (Marsh, 1986d; 1987; Marsh, Barnes & Hocevar, 1985; Marsh, Byrne & Shavelson, in press; Marsh & Shavelson, 1985). In separate factor analyses of responses by children in second thru fifth grades (ages 6 to 11), Marsh and Hocevar (1985) showed the SDQ factor loadings to be relatively independent of age though correlations among the factors were smaller for the older children (also see Marsh & Shavelson, 1985). Support for the content specificity of the SDQ factors also comes from many studies relating SDQ responses to content-specific criterion variables (e.g., academic achievement, teacher ratings of students' self-concepts, peer ratings, self-attributions of the causes of academic successes and failures, and interventions designed to enhance self-concept) that are summarized by Marsh (in press-b). In a review of SDQ research stimulated by the Shavelson model, Marsh and Shavelson (1985) concluded that self-concept cannot be adequately understood if its multidimensionality is ignored.

SDQ research has, however, also resulted in a better understanding and a refinement of the Shavelson model. In particular, the content specificity of self-concept was stronger and the strength of the self-concept hierarchy was weaker than initially assumed. This was most clearly evident for academic component of self-concept that has been the focus of most research stemming from the Shavelson model. Shavelson et al. (1976) initially hypothesized that specific components of academic self-concept (e.g., reading and mathematics) would be substantially correlated so that they could be incorporated into a single dimension of academic self-concept. Subsequent research, however, showed that verbal and math self-concepts were nearly uncorrelated with each other and had quite distinct relations to verbal and math achievement scores (Marsh, 1986d). Consistent with these findings, hierarchical factor analyses indicated that two higher-order constructs, verbal/academic and math/academic, were required instead of the one academic factor originally posited by Shavelson (Marsh, 1987; Marsh & Hocevar, 1985; Marsh & Shavelson, 1985). Marsh, Byrne and Shavelson (in press) demonstrated the consistancy of these findings in a MTMM study of responses to math, verbal, and general academic scales from three different self-concept instruments. They concluded that academic self-concept cannot be adequately understood from just a general academic measure and recommended that researchers use at least verbal and math self-concept scales.

The Perceived Competence Scale For Children (PCS). Research based on Harter's (1982, 1983) PCS, though not formally based on the Shavelson model, also provides strong support for many aspect of the model. Harter (1982) focused on perceived competence and hypothesized that children do not feel equally competent in every skill domain. In seeking the critical domains for elementary school children she chose to assess the social, physical and cognitive domains for her scale. She further hypothesized that children (age 8 and older) "have also constructed a view of their general self-worth as a person, over and above these specific competence judgments" (p. 88) and thus included a fourth, general scale on her instrument. Factor analytic results clearly supported the separation of the four scales. In separate factor analyses of responses by students in fourth thru ninth grades, Harter (1982) found reasonably similar factor loadings, though factor loadings were somewhat less congruent for responses by third grade students. The PCS may not be appropriate for children less than 8 years old (Harter, 1982; 1983; Silon & Harter, 1985), and Silon and Harter found that the a priori PCS structure was not well defined for responses by educably mental retarded children who were older than 8 but had mental ages of less than 8.

Based on her 1982 factor analytic results, Harter (1983, p.331) concluded that: "Given the repeated demonstrations of this stable factor structure, we cannot concur with Winne, Marx and Taylor (1977), who find little evidence that children make distinctions between physical, social, and academic facets of self-concept." She further suggested that the MTMM study by Winne et al. failed to find support for divergent validity because there was little a priori attention given to the construction of items to represent adequately the physical, social and academic domains on the instruments used in that study. Evidence was not yet available, however, in which responses to different, more suitable self-concept instruments did demonstrate convergent and discriminant validity with respect to these content domains. The SDQ and the PCS, because both are designed for use by children and claim to measure the domain specific components considered by Winne et al., appear to be well-suited for this purpose.

In summary, theoretical and empirical advances in self-concept research clearly support the multidimensionality of the construct. Factor analytic studies generally support the separation of at least general, physical, social, and academic components of the construct. For instruments designed for children, support for these conclusions is particularly strong for the SDQ and PCS instruments.

Multidimensionality of Perceived Control

Salient Factors and Test Design

Historically, the study of individual differences in perceived control stems largely from the work by Rotter (1966, 1975). Rotter hypothesized a general, bipolar dimension: the locus is internal if one perceives events to be contingent upon one's own effort or relatively enduring characteristics such as ability; the locus is external if one perceives beliefs to be contingent upon causes not under one's control such as luck, fate, task difficulty, and the influence of powerful others (Lefcourt, 1976; 1981; Rotter, 1966; 1975; Stipek & Weisz, 1981). In his original research, Rotter tried to identify multiple dimensions of perceived control, but, as noted by Lefcourt "this early attempt at creating a complex scale succubmed to the rigors of factor analyses" (1981, p. 3). Unlike early self-concept research that was fraught with a unmanageable number of different instruments, Rotter's 1966 instrument largely dominated locus of control research. In early research with both constructs, however, factor analytic studies failed to support domain specific dimensions of the constructs and led researchers to emphasize a single, generalized dimension. Ironically, however, Marsh and Richards (1987) reported that at least five factors were consistently identified in factor analyses of responses to the Rotter instrument and suggested that claims of the instruments' unidimensionality were apparently due a misunderstanding of factor analysis. Three of the factors identified by Marsh and Richards referred to perceived control in specific domains (academic, social, and political) while two referred to different causes (luck and success via personal initiative).

Perceived control research has been substantially influenced by attribution theory (see Marsh, Cairns, Relich, Barnes, & Debus, 1984, for further discussion). Though based in part on Rotters' work, attribution theory differs in at least two important respects. First, attribution theory has placed more emphasis on particular causes (e.g., ability, effort, luck and task difficulty) and argued that these could not be explained by a single internal-external dimension. Weiner (1972, 1974) posited two separate dimensions consisting of locus (internal-external) and stability (stable-unstable) and more recently (Weiner, 1979) has argued for a third dimension of controllability (controllable-uncontrollable). The second difference is that attribution theory has emphasized the effects of situational variables that are experimentally manipulated instead of the dispositional differences that are the focus of locus of control research.

one instrument incorporating this sort of this test design (e.g., Connell, 1985; Lefcourt, 1981; Marsh, Cairns, et al., 1984; Marsh, 1984) has been used widely, there is insufficient evidence to evaluate either the three facet test design or instruments that are based on it.

The Multidimensional Measure of Children's Perceptions of Control (CPC)

Connell (1985) introduced the CPC and presented theoretical and empirical support for it. This instrument is particularly relevant to the present investigation because its design is based on the three facet model, because it is apparently the only instrument claiming to measure children's perceived control for general, academic, social and physical domains, and because support for its construct validity was based largely on relations between it and the PCS self-concept instrument. The CPC test design incorporates three facets: cause (internal, powerful others, or unknown), outcome (success or failure), and content domain (physical, social, academic or general). Each of the 24 (3 x 2 x 4) combinations of these three facets is inferred on the basis of responses to two items. Harter and Connell (1984) reported that whereas children apparently do not make attributions based on luck or chance, they will indicate that they don't know who or what is responsible and that this "unknown" cause was an important predictor of other variables. The assumption of content domain specificity and the selected domains were based on Harter's (1982) earlier research on the content specificity of perceived competence. Harter and Connell (1984) described a theoretical model positing causal relations between actual competence, perceived competence, perceived control, and intrinsic vs. extrinsic motivational orientations that was the basis of many of Connell's tests of the construct validity of CPC responses. Connell (1985) argued for the superiority of the CPC because it provided domain-specific measures and because it included the previously untapped dimension of unknown control.

Connell did not provide clear guidance about what scores should be used to summarize CPC responses. The 4x2x3 test design makes possible the derivation of 24 scores representing combinations of the 3 facets, another 26 scores presenting various combinations of two facets averaged across levels of the remaining facet, another 9 scores representing levels of each facet averaged across levels of remaining two facets, and, perhaps, a total score. Connell also proposed internal-external scores that are the sum of internal responses minus the sum of powerful other responses. This results in 15 additional scores representing various combinations of the content and outcome facets. Harter (1985) combined the unknown and powerful other causes one instrument incorporating this sort of this test design (e.g., Connell, 1985; Lefcourt, 1981; Marsh, Cairns, et al., 1984; Marsh, 1984) has been used widely, there is insufficient evidence to evaluate either the three facet test design or instruments that are based on it.

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In assessing support for the domain specificity of responses to the CPC, Connell presented factor analyses, correlations among CPC scales, and correlations between CPC scales and other constructs. Separate factor analyses of scores within each content domain resulted in factors reflecting primarily the cause facet (internal, unknown, and powerful others), but sometimes supported the outcome facet in that separate cause factors were defined by responses to success and failure outcomes (e.g., separate internal success and internal failure factors). It is important to note, however, that these factor analyses did not test the domain specificity of CPC responses because each factor analysis was conducted on responses to items within the same content domain. Tests of the domain specificity could have been conducted by factor analyzing responses to items or subscale scores from different content domains, but Connell did not present such analyses. He justified this decision on the basis of "the previous factor analytic work of Harter (1982) [for the PCS self-concept instrument] demonstrating the domain specificity of children's self-perceptions" (1985, p. 1025, brackets added). Whereas Harter's PCS research does provide an adequate basis of hypothesizing the domain specificity of CPC responses, it does not constitute support for this hypothesis.

Connell (1985) examined support for convergent validity by relating CPC responses from the cognitive, social and physical domains to self-concept (PCS) responses, teacher ratings, achievement test scores (for the academic domain), academic motivation measures (for the academic domain), and peer ratings (for the social domain). Because correlations within each content domain were based on different combinations of CPC scales and different criteria, the results are not easily summarized. Of the 305 correlations reported by Connell, only 128 (42%) were statistically significant, none were greater than .5 and only two were greater than .4. For only the Physical domain of the CPC were a majority of the correlations statistically significant, and most of these were correlations based on responses to two self-report instruments. For the cognitive, social and physical domains, the best support respectively was for scales representing the unknown causes, powerful others, and the internal-external score for success outcomes. In summary, whereas this pattern of convergent correlations may provide some support the construct validity of CPC responses, the size of the correlations is modest -- particularly since many of the correlations were based on responses to two self-report instruments -- and the nature of the relations is complex. It is also important to note that Connell did not report tests of the divergent validity of CPC responses based on these correlations. This could have been accomplished by relating the criterion measures relevant to each CPC domain to responses from other CPC domains (e.g., academic criteria should be more highly correlated to CPC responses in the academic domain than to other CPC domains or to CPC total scores), but Connell did not report these correlations.

Connell (1985, Table 4) did present correlations between 12 CPC subscales (3 causes x 4 content domains, averaged across success and failure responses) that are relevant to support for the domain-specificity of CPC responses. Correlations in this table can be divided into three types, those based on scales having (a) the same cause but different domains (e.g., unknown social and unknown academic); (b) different causes but the same domain (e.g., internal academic and unknown academic); and (c) different causes and different domains (e.g., power others social and unknown physical). Using the logic of MTMM analyses, support for the discriminant validity of the different causes requires that (a) be substantially higher than (c) and support for the discriminant validity of the different domains requires that (b) be substantially higher than (c). The medians of correlations reported by Connell were .29 for (a), .14 for (b), and .10 for (c). These results provided reasonable support for the divergent validity of different causes, but there was little support for the divergent validity of the different content domains. Furthermore, in apparent contradiction to the hypothesis that the content specificity should increase with age, support for this specificity was weaker for the junior high school respondents than for the elementary school respondents (see further discussion in relation to results of the present study summarized in Table 6).

In summary, Connell (1985) described a new, potentially important measure of perceived control and examined its construct validity by relating it to parallel measures of perceived competence and to other pertinent criteria. Of particular relevance to the present investigation, Connell claimed that an important advantage of the CPC was its ability to differentiate perceived control in different content domains. Connell did not, however, pursue many tests of this claim and the limited evidence that he offered provided little support for the claim. Hence, one purpose of the present investigation is to pursue tests of domain specificity of the CPC responses that were suggested earlier.

The Present Investigation

The purpose of the present investigation is to examine support for the construct validity of two multidimensional measures of self-concept (Marsh's SDQ and Harter's PCS) and a multidimensional measure of perceived control (Connell's CPC). As described earlier, all three authors: (a) emphasized the importance of a multidimensional, domain-specific perspective; (b) designed their instruments to provide distinguishable measures for general, academic, social and physical content domains; (c) used factor analyses as one basis of support for their instrument; and (d) posited a logical pattern of relations between self-concept and perceived control as a second basis of support. The present investigation can logically be divided into two parts.

The first part of the study focuses on the construct validity of the two self-concept instruments. Separate factor analyses were used to test the a priori factors that each instrument was designed to measure. Then, MTMM analysis of correlations between responses to the two instruments was used to test their convergent and discriminant validity. This MTMM analysis, because both the SDQ and PCS are designed to measure physical, social, and academic self-concepts resembles the classic MTMM studies conducted by Winne, Marx and Taylor (1977) and by Marx and Winne (1978). On the basis of their MTMM studies those authors concluded that children were apparently unable to distinguish between these domain-specific self-concepts. Because the present investigation is based on two instruments that previous research has shown to differentiate between these facets, however, it is predicted that the results will demonstrate both the convergent and discriminant validity of the self-concept responses. Also considered were verbal and mathematical achievement measures, and Ryan's (no date; also see Connell & Ryan, 1984; Ryan, Connell & Grolnick; in press) measure of academic motivation. Using the logic of MTMM analysis, each of these additional measures should be subtantially more correlated with academic self-concept measures than with nonacademic self-concept measures.

The second part of the study focuses on the construct validity of the perceived control (CPC) instrument. Factor analysis was used to search for salient factors in responses to the CPC. Then, scores derived from the CPC were correlated with scores from the SDQ, PCS, achievement motivation, and academic achievement measures considered in the first part of the study. These correlations were used to test a variety of different hypotheses, but the major emphasis was on tests of the divergent validity of CPC responses in relation to the different content domains that it is designed to measure.

Method

Sample and Procedures

Subjects were the 510 students (42% female) attending grades 7, 8 or 9 at one of two private, single-sex high schools in metropolitan Sydney. Students in both high schools came from predominantly middle class families. In both high schools, classroom teachers administered all the self-report instruments on one day and the achievement tests on a second day one week latter. Teachers were given written instructions about how to administer the measures including instructions that were read aloud to their students. The set of self-report instruments required slightly more than one hour to complete whereas the set of achievement tests required slightly less than one hour to complete.

Test Instruments

Self-concept instruments. Students' multidimensional self-concepts were measured with Harter's (1982, 1983) PCS and Marsh's (in press-b; 1986d; Marsh & Hocevar, 1985) SDQ. The PCS is designed to measure four self-concept factors (physical, social, general and cognitive) whereas the SDQ is designed to measure 8 self-concept factors (physical, peer relations, general, school, reading, math, parent relations, and physical appearance).

On the PCS each "item" actually consists of two logically opposed statements (e.g., some kids often forget what they learn; other kids can remember things easily). The child first decides which statement is most most like him or her, and then indicates whether that statement is "really true of me" or "sort of true of me." Responses are scored on a 1 to 4 continuum where 4 represents the highest level of perceived competence (i.e., the positively worded item is really true of me). PCS consists of responses to 28 items (i.e, 56 statements) and 7 items are used to infer each of the four domain-specific scales. For purposes of factor analysis, Harter (1982) factor analyzed responses to each of the 28 items, and this procedure was used here as well.

On the SDQ children respond to each item along a 5-point true-false scale. Scores for the SDQ are based on responses to 64 positively worded items, 8 for each of the 8 domain specific scales. (The SDQ also contains an additional 12 negatively worded items to disrupt response biases but Marsh (1986a) showed that responses to these items are invalid for young children, and so they are not scored.) Factor analyses of SDQ responses (e.g., Marsh, 1986d; in press-b) are based on item-pair scores such that the first two items in each scale are summed to form the first item pair, the next two the second item pair, etc. In this way, the 64 items are used to form 32 item-pairs, 4 for each of the 8 domain specific factors. This procedure was used here as well.

For purposes of the MTMM analyses, the first 3 SDQ factors are posited to correspond to the first 3 PCS factors, whereas the sum of the SDQ academic factors (school, reading and mathematics) is posited to correspond to the PCS cognitive scale. A content analysis of the four pairs of matching SDQ and PCS scales suggested that the social self-concept scales were most parallel. The pair of physical self-concept scales differed in that one SDQ item referred to physical attributes (I have good muscles) whereas two of the PCS items referred to trying new outdoor activities. The pair of general self-concept scales differed in that three SDQ items asked children to compare themselves with others or to indicate what others thought of them, whereas two PCS items emphasized self-assurance. The pair of academic self-concept scales differed in that the SDQ score was based on a composite of items referring specifically to reading, math and school components whereas the PCS items generally did not refer to specific academic subjects. Also, though both academic scales included cognitive (e.g., I learn things quickly) and affective (I look forward to school), the affective component was stronger for the SDQ (also see Harter and Connell, 1984, for a related distinction and its relation to academic motivation). Based on this content analysis, it is expected that the convergent validity correlation relating the two social scales will be larger than the other three convergent validities.

Perceived control instrument. Students' multidimensional perceptions of control were measured with Connell's (1985) CPC. On the CPC children respond to each of 48 items along a 4-point (very true, sort of true, not very true, not at all true) response scale. Each item is designed to measure one of three content domains (physical, social, general or academic), one of two outcomes (success or failure) and one of three causes (unknown, powerful other, and academic). The design and rationale of the CPC and a variety of scores that can be derived from CPC responses were described earlier, but the focus of the present investigation is its ability to differentiate among self-perceptions in the four content domains.

Motivation. The current version of the Self Regulation Questionnaire described by Ryan (no date; also see Connell & Ryan, 1984; Ryan, Connell & Grolnick; in press) consists of 33 items, each of which is answered on a 4-point (very true, sort of true, not very true, not at all true scale). As described by Ryan (no date) and Ryan, Connell & Grolnick; in press), scores to this instrument can be used to compute a total self-determination index (SDI) that reflects a continuum varying from external regulation to intrinsic regulation. Ryan (no date) and Ryan, Connell & Grolnick; in press) reported that responses to this instrument were significantly correlated with responses to Harter's (1982) measure of mastery motivation, Harter's (1982) perceived cognitive competence, teacher ratings of students' self-esteem, de Charms (1976) perceptions of class climate scale, and Connell's (1985) PCS scale.

Mathematics and Reading achievement. Reading achievement was assessed with both forms of the GAPADOL (McLeod, 1972), a modified cloze-type test on which students are required to fill in the gaps that appear in different passages. McLeod states that this cloze-type tests correlates with other reading tests close to the limits of the tests' reliabilities. Using a version of this test designed for younger children, Marsh and Butler (1904) reported that total scores had a .9 coefficient alpha estimate of reliability, correlated .82 with a total score from the Stanford Diagnostic Reading test, and was slightly more positively correlated with teacher ratings of reading achievement than was the Stanford test. For purposes of the present investigation, reading achievement is represented as the total of both forms of the GAPADOL. Mathematics achievement was assessed with the Moreton Mathematics Test (Andrews, Elkin & Cochrane, 1974). The test consists of 30 items involving both computation and story problems.

Statistical analyses

Statistical analyses in the present investigation were performed with the commercially available SPSSx (SPSS, 1986) statistical package. In preliminary analyses, achievement scores for both tests were found to be linearly related to year in school (the nonlinear component was nonsignificant). Using multiple regression, this linear effect of year in school was removed from the achievement test scores used in subsequent analyses. Coefficient alpha estimates of reliability were computed for scores from each of the self-report instruments and the achievement tests, and these are presented in Results section. Published factor analyses of responses to both the PCS and SDQ have identified the factors that each is designed to measure and these findings were replicated in results to be discussed. Factor scores based on each of these factor analyses, a principal axis extraction using iterated communality estimates, a Kaiser normalization, and an oblique rotation (see SPSSX, 1986), were used in subsequent analyses. Because neither Connell (1985) nor the factor analytic results to be described provided a clear basis for what scores should be used to summarize responses to the CPC, a wide variety of scores were considered. Because the testing was done on two different days and because students occasionally failed to complete all items on the self-report instruments, only about 80% of the students had complete responses for all the materials. Results to be presented here are based on pair-wise deletion for missing values, but unreported results using list-wise deletion for missing values resulted in nearly identical results.

Results and Discussion

Construct Validity of Multidimensional Self-concept Responses.

Factor analyses. Factor analyses of responses to the SDQ (Table 1) and the PCS (Table 2) both identified the factors that each instrument is designed to measure. For SDQ responses the target coefficients (factor loadings of items designed to infer each factor that appear in boxes) are consistently large (.33 to .92; Median = .77) whereas nontarget loadings are much smaller (-.11 to .24; median = .04). Similarly, for PCS responses the target coefficients are consistently large (.32 to .75; Median = .56) whereas nontarget loadings are much smaller (-.14 to .34; median = .04). These results replicate previous factor analyses of responses to each of the self-concept instruments.

Insert Tables 1 and 2 About Here

MTMM analyses. For purposes of this MTMM analysis only mathching PCS (physical, social, general and cognitive) and SDQ (physical, peer relations, general and academic) scores are considered (Table 3). In applying the 4 criteria developed by Campbell and Fiske (1959; Marsh, in press-a) it was found:

1) the four convergent validities (those with asterisks in Table 3) are all statistically significant and substantial (mn $r = .65$);

2) convergent validities (mn $r = .65$) are higher than other correlations in the same row and same column of the square (heterotrait-heteromethod) submatrix relating PCS and SDQ responses (mn $r = .30$) for all 24 comparisons, thus supporting this aspect of discriminant validity;

3) convergent validities (mn $r = .65$) are higher than other (heterotrait-homomethod) correlations among PCS scales (mn $r = .41$) and among SDQ scores (mn $r = .45$) for 23 of 24 comparisons, thus supporting this aspect

of discriminant validity; and

4) the pattern of correlations among PCS and SDQ scores are similar, suggesting that the pattern is independent of the instrument.

Insert Table 3 About Here

Correlations involving the remaining SDQ scores (school, reading, mathematics, physical appearance, and parent relations), though not formally considered as part of the MTMM analysis, also support the MTMM findings: (a) the SDQ school, reading, and math scores are most substantially correlated with the PCS cognitive score (.40 to .54), less correlated with the general scores from each instrument (.22 to .34), and even less correlated with the remaining scales (.01 to .33); (b) the SDQ physical appearance score is most highly correlated with the general scale followed by the physical ability and social scales for both instruments; and (c) the SDQ parents scale is most highly correlated with the general scales for both instruments.

In summary, these results provide strong support for both the convergent and discriminant validity of responses to these two multidimensional self-concept instruments. These results also differ dramatically from those of the classic MTMM studies conducted by Marx and Winne (1978; Winne, Marx & Taylor, 1977) that were based on other instruments. The different results, as anticipated by Harter (1983), apparently are due to using two self-concept instruments in which the items are more carefully constructed with respect to their domain specificity.

Additional tests of construct validity. Correlations between the academic motivation and self-concept scores indicate that students with a more intrinsic orientation have higher self-concepts. For both PCS and SDQ, academic motivation scores are most substantially correlated with academic self-concept measures (.35 and .48), less correlated with general self-concept (.26 and .21), and relatively uncorrelated with physical and social self-concepts (.01 to .13). The motivation score is more highly correlated with the SDQ school (.48) and total academic scores (.48) than the PCS academic scale (.35). This finding is consistent with Connell and Harter's (1984) speculation that affective components of academic self-concept may be more strongly related to achievement and the earlier observation that the affective component is stronger in the SDQ than in the PCS. These results provide clear support for the convergent and discriminant validity of the self-concept responses with respect to this academic motivation measure. Somewhat surprisingly, however, the motivation measure is not significantly correlated with reading or mathematics achievement scores. This indicates that motivation/self-concept relations are independent of the achievement/self-concept relations.

Reading and math achievement scores are most highly correlated with the PCS academic score and less highly correlated with the other PCS scores. Reading achievement is most highly correlated with the SDQ reading score, less correlated with the SDQ school and total academic scores, uncorrelated with the SDQ math score, and uncorrelated or negatively correlated with the remaining SDQ scores. Math achievement is most highly correlated with the SDQ math score, less correlated with the SDQ school and total academic scores, still less correlated with the SDQ reading score, and not significantly correlated with the remaining SDQ scores. Results for both the PCS and SDQ support the convergent and discriminant validity of the domain specific measures of self-concept with respect to academic achievement, but the SDQ results further support the separation of the reading and math self-concepts as emphasized in the revision of the Shavelson model (Marsh, Byrne & Shavelson, in press; Marsh & Shavelson, 1985).

Insert Table 4 About Here

Age differences in the construct validity. Though not the focus of the present investigation, Harter (1981) noted that correlations between academic self-concept and academic achievement indicators varied systematically with grade level. The size of these correlations increased during elementary school years, dropped in 7th grade, and then increased in 8th and 9th grade to levels higher than in elementary school years. This suggests a developmental trend in which academic self-concept becomes more closely aligned with external criteria as children grow older, but also suggests a temporary disruption during which students have to reestablish an appropriate frame of reference after moving from elementary to high school. In the present investigation, 7th grade students had also recently moved from elementary schools and the pattern of results (Table 4) is similar to that observed by Harter in her junior high school sample. The correlations between achievement test scores and the corresponding academic self-concept scores, and also between matching SDQ and PCS scales (the convergent validities in the MTMM analyses), are systematically higher in 8th and 9th grades than in 7th grade. Because the present results do not include responses by elementary students, however, it is not possible to determine whether the lower correlations in 7th grade represent a temporary disruption due to changing schools in addition to a general developmental trend.

Construct Validity of Multidimensional Perceived Control Responses.

Factor analyses. Factor analysis is best suited to test scores that reflect a single-facet design as with the self-concept measures (the single facet is the content domain). Because the CPC has three facets, it is not so well suited to factor analysis. For example, whereas it is possible that empirically derived factors will be associated with a single level from one of the facets, it is likely that some of the derived factors will reflect complicated combinations of levels from two or more of the facets. This potential problem is exacerbated by the fact that each of the 24 combinations of three facets is represented by only 2 items. Given the exploratory nature of these analyses, separate factor analyses were conducted on the responses to the 48 CPC items, the 24 scores representing all possible combinations of the 24 (3x2x4) subscales, and the 12 scores reflecting the 3 x 4 combinations of cause and content domain (averaged across outcome levels).

For factor analyses of the 48 items, the 24 subscales, and the 12 subscales there was a reasonable similarity in solutions based on 2, 3 and 4 factors. For two factor solutions the factors were associated with the external (unknown and powerful other) subscales and the internal subscales. For the three-factor solutions the factors were associated with the unknown, powerful other, and internal subscales. For the four-factor solutions there were again factors associated with each of the three causes, and a fourth factor defined primarily by some of the physical scales. The four factor solution for the analysis of 24 subscales is shown in Table 5. Whereas each of the first three factors is well defined, only the physical success subscales have substantial loadings on the fourth factor. For factor solutions with 5 or more factors, there was typically at least one factor that was either not well defined or was not readily interpretable. In no instance were there additional factors in which a majority of the scores from the same content domain loaded on one factor.

Insert Table 5 About Here

The exploratory nature of these factor analyses dictates that they be interpreted cautiously, but several observations are apparent. First, factors corresponding to the different causes were consistently well defined, thus supporting the construct validity of this facet of the CPC. Second, except for the physical domain, factors corresponding to the different content domains and to the different outcomes were not readily apparent. These results, then, provide little support for the construct validity of these two facets of the CPC. The identification of factors associated with the different causes is consistent with factor analytic results presented by

Connell (1985), but he did not present any factor analyses testing whether factors associated with different content domains could be identified. The present findings may, however, call into question his claim that the CPC is able to adequately discriminate perceived control in the four content domains that are assessed by the instrument.

Insert Table 6 About Here

CPC scale correlations. Correlations among the 12 CPC scales (4 content x 3 causes averaged across outcome) was the information presented by Connell (1985) most relevant to the domain specificity of the CPC scales. The correlations from Connell's sample of junior high students are presented with the corresponding correlations derived from the present investigation in Table 6. Correlations among different scales representing the same content domain (median rs = .12 for both sets of data) are typically small, and nearly the same as correlations between scales in which both the content domain and cause differ. For both sets of data, the two external scales for the same content domain are positively correlated whereas these external scales negatively or nonsignificantly correlated with the corresponding internal scale. In contrast, correlations among different scales representing the same cause are substantially larger for Connell's data (median $r = .26$) and the present data (median $r = .31$). Consistent with interpretations of the factor analyses of CPC responses, these results provide support for the distinction between different causes but call into question the claim that the CPC is able to adequately discriminate beteen perceived control in the four content domains.

Construct validity. Correlations between a wide variety of CPC scores and criterion variables are presented in Table 7. For each of the 4 content domains 13 different scores (see Table 7) are considered that represent various combinations of the 3 causes (unknown, powerful others, and internal) and 2 outcomes (success and failure). Corresponding total scores were obtained by summing across the 4 domain-specific scores.

Insert Table 7 About Here

Inspection of correlations based on the total scores reveals several consistent patterns. First, the criterion variables are consistently correlated negatively with unknown and powerful other scales and positively with internal scales. Second, criterion variables are more highly correlated with success scales than with either failure scores or the average of success and failure scales. Third, the outcome variables are more highly correlated with the augmented internal/external scales (internal minus powerful other and unknown causes) than Connell's (1985) original internal/external scales (internal minus power other). These findings support the construct validity of scales defined by the three causes but suggest that all three may be parsimoniously incorporated into a single (augmented) internal/external score.

The major purpose of this analysis is to test the convergent and divergent validity of the CPC responses with respect to the four content domains. Adapting the logic of MTMM analyses, three criteria were used: (a) support for convergent validity requires domain specific scores to be substantially correlated to their respective criterion variables (these correlations, analogous to convergent validities, are marked with asterisks in Table 7); (b) support for divergent validity requires the convergent validities to be higher than correlations with other (noncriterion) outcome variables; and (c) support for convergent validity requires the convergent validities to be higher than correlations involving the corresponding total CPC scores (i.e., those averaged across the domain-specific scores). Because no attempt was made to compare convergent validities to correlations among the self-concept scores (Table 3) or correlations among CPC scores (Table 6) as proposed in Campbell and Fiske's third criterion (see earlier discussion), these criteria may be less demanding than those typically used in MTMM analyses. The application these criteria suggests that:

1. for physical CPC scores there is support for both convergent and discriminant validity. This support is based entirely on success outcomes, but generalizes across the three causes. The highest correlations are between the augmented internal/external success scales and the physical self-concept scales (.57 and .52).

2. for social CPC scores there is weak support for convergent validity but little support for discriminant validity. Whereas the correlations between the augmented internal/external success scores and social and peer relations self-concept scales are modest (.29 and .23), they are not as high as correlations with other self-concept scores or with the CPC total scores. For only the unknown/failure scale is there any indication of discriminant validity.

3. for general CPC scores there is modest support for convergent validity but no support for discriminant validity. Whereas the correlations between the augmented internal/external success scores and the general self-concept scores are modest (.33 and .29), they are not as high as correlations with the CPC total scores. This lack of discriminant validity is consistent for each of the general CPC scores.

4. for cognitive CPC scores there is weak support for convergent and

discriminant validity. This support, however, is based primarily on responses to the unknown/success scales. This pattern of results is consistent for the self-concept and achievement criterion scores. In relation to academic motivation, however, there is little support for either the convergent or divergent validity of the CPC academic responses.

In summary, across the four content domains of the CPC, there is good support for the convergent and divergent validity of the physical scales, modest support for the convergent validity of the remaining scales, and little or no support for the discriminant validity of remaining scales. Support for convergent validity found here is similar to, or somewhat better than, that reported by Connell (1985). Connell did not, however, present tests of the discriminant validity of the CPC scales. The present findings, however, call into question his claim that the CPC is able to adequately discriminate perceived control in the four content domains that are assessed by the instrument.

Summary and Recommendations

The purpose of the present investigation is to examine support for the construct validity of two multidimensional measures of self-concept (Marsh's SDQ and Harter's PCS) and a multidimensional measure of perceived control (Connell's CPC) in relation to their ability to discriminate among self-perceptions in different content domains. Results of factor analyses, MTMM analyses, and correlations with other criterion measures all provided support for the convergent and divergent validity of responses to both self-concept instruments. In contrast, analyses of the perceived control responses provided only modest support for convergent validity and little support for the discriminant validity of responses to other than the physical domain.

Based on the present findings, use of either of the PCS or the SDQ self-concept instruments appears to be warranted. The distinctive features of the two instruments are the additional scales and added length of the SDQ, and the alternative response format used on the PCS. (On the PCS each "item" consists of two logically opposed statements so that children first select which statement is most appropriate and then the extent to which that statement applies to them). Marsh (1986d; Marsh, Byrne & Shavelson, in press) provided convincing evidence for the separation of the reading and math self-concepts and argued that academic self-concept cannot be adequately understood if only a general academic scale is considered. Hence, researchers interested in separate estimates of reading or math self-concepts should use the SDQ. Similarly, if researchers want measures of physical appearance or parent relations self-concepts, then the SDQ is recommended. Whereas the SDQ has three times as many items as the PCS, the fact that each PCS "item" actually consists of two statements largely offsets this difference. In the present investigation there was little difference in the time required to complete the two instruments. Harter (1982) suggested that the PCS response format reduces social desirability responding, which may be an important advantage of the PCS. I know of no empirical support for this suggestion, however, that is based on comparisons of responses to the same items using a standard and the alternative response format. Furthermore, particularly for younger children or less intelligent children, the format may be confusing (also see Marsh, 1986a, on the use of negatively worded items with young children) and the PCS factor structure is not so well defined for these groups (e.g., Harter, 1982; Silon & Harter, 1985). Hence, whereas the alternative response format may constitute an advantage of the PCS, further evaluation of it is needed -- particularly for younger and less intelligent children.

In contrast to the two self-concept instruments, researchers should be cautious about using the CPC. According to Connell (1985), the main advantages of the CPC over other instruments are its domain specific scores and the incorporation of the "unknown" cause. In apparent contradiction to the first claim, the results of the present investigation suggest, except for the physical domain, that the CPC responses do not have much discriminant validity in relation to the content domain. It should be noted that Connell (1985) provided little or no support for this claim. The present results may, however, provide some support Connell's claim about the potential usefulness of his unknown cause scales. Other concerns with the CPC are the limited number of causes (e.g., using a single internal cause instead of more specific internal causes as noted by Connell, 1985, p. 1039), the lack of guidance about what scores should be used to summarize CPC responses, the modest internal consistency estimates of reliability, and the typically small size of correlations between CPC scores and criterion measures reported here and by Connell (1985). These cautions should, perhaps, be tempered by the observation that there are few if any instruments designed for children that have demonstrated divergent validity with respect to such a wide variety of content domains (but see Lefcourt, 1981; Marsh, 1984; 1986c). There is a clear need for further instrument development in this area, including, perhaps, the further refinement of the CPC.

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TABLE 1

Factor Analysis of Responses to the Self Description Questionnaire (SDQ)

SDQ Subscales	Factor Loading Matrix								
	PHYS	APPR	PEER	PRNT	READ	MATH	SCHL	GENL	communality
Phys1	$\boxed{75}$	16	05	05	04	00	09	-09	70
Phys2	$\boxed{57}$	17	13	04	00	05	02	08	58
Phys3	$\boxed{79}$	-01	02	03	00	05	03	10	72
Phys4	$\boxed{73}$	-01	04	-04	04	-01	00	24	73
Appr1	10	$\boxed{81}$	01	01	00	05	03	05	80
Appr2	05	$\boxed{76}$	02	01	03	01	08	11	76
Appr3	17	$\boxed{53}$	23	-02	03	02	-01	15	67
Appr4	01	$\boxed{54}$	09	-01	-01	02	01	33	65
Peer1	05	07	$\boxed{73}$	09	01	01	-03	01	63
Peer2	05	00	$\boxed{69}$	03	01	09	09	10	64
Peer3	07	07	$\boxed{65}$	-01	-01	06	04	07	58
Peer4	06	07	$\boxed{68}$	02	03	-02	02	24	77
Prnt1	05	06	-01	$\boxed{76}$	-03	-01	09	02	65
Prnt2	-01	09	01	$\boxed{76}$	-01	00	08	00	64
Prnt3	02	-03	07	$\boxed{80}$	06	04	01	04	71
Prnt4	02	-11	08	$\boxed{84}$	02	06	-01	14	81
Read1	00	09	-02	01	$\boxed{88}$	-01	06	02	84
Read2	02	04	02	01	$\boxed{92}$	01	04	00	88
Read3	08	-03	01	-01	$\boxed{86}$	02	09	04	83
Read4	-01	-06	03	01	$\boxed{86}$	02	09	09	84
Math1	03	01	07	03	-04	$\boxed{76}$	17	-07	72
Math2	02	05	03	02	01	$\boxed{83}$	09	07	84
Math3	02	00	03	06	04	$\boxed{86}$	08	05	87
Math4	02	02	02	-03	03	$\boxed{86}$	11	09	91
Schl1	04	16	-04	05	07	08	$\boxed{72}$	03	73
Schl2	05	03	-03	02	15	20	$\boxed{44}$	21	53
Schl3	04	02	03	08	09	09	$\boxed{72}$	-03	67
Schl4	02	-08	10	02	04	12	$\boxed{76}$	10	77
Genl1	09	20	16	21	02	05	10	$\boxed{33}$	54
Genl2	20	15	05	17	06	03	09	$\boxed{48}$	67
Genl3	00	18	30	05	06	00	06	$\boxed{52}$	72
Genl4	09	08	05	02	04	04	07	$\boxed{67}$	67
Factor Correlations									
PHYS	100								
APPR	34	100							
PEER	27	30	100						
PRNT	13	10	18	100					
READ	11	07	06	05	100				
MATH	12	10	15	10	08	100			
SCHL	19	19	30	21	29	44	100		
GENL	36	46	44	23	19	19	29	100	

Note. The four measured variables designed to measure each factor are the sum of responses to pairs of items. All parameters are presented without decimal points. Factor loadings in boxes are the loadings of item-pairs designed to measure each factor (target loadings).

TABLE 2

Factor Analysis of Responses to the Perceived Competence Scale (PCS)

PCS Item	Factor Loading Matrix COG	SOC	PHY	GEN	commu-nality
1	$\boxed{62}$	02	-08	00	37
5	$\boxed{54}$	06	-04	05	32
9	$\boxed{50}$	00	13	10	34
13	$\boxed{56}$	-04	08	04	35
17	$\boxed{62}$	02	01	01	40
21	$\boxed{47}$	-06	02	09	25
25	$\boxed{60}$	-02	09	00	39
2	00	$\boxed{62}$	08	00	42
6	07	$\boxed{75}$	03	-04	57
10	18	$\boxed{32}$	14	22	34
14	-14	$\boxed{62}$	04	-01	41
18	-02	$\boxed{56}$	10	12	42
22	00	$\boxed{64}$	09	11	52
26	10	$\boxed{42}$	04	15	28
3	-04	06	$\boxed{65}$	05	46
7	00	03	$\boxed{51}$	17	36
11	09	02	$\boxed{60}$	05	43
15	06	08	$\boxed{62}$	-10	41
19	02	09	$\boxed{47}$	10	30
23	04	-04	$\boxed{68}$	09	51
27	-02	34	$\boxed{39}$	04	37
4	05	-10	05	$\boxed{59}$	35
8	19	11	13	$\boxed{41}$	37
12	05	33	-06	$\boxed{47}$	43
16	03	23	02	$\boxed{47}$	38
20	00	06	04	$\boxed{69}$	53
24	07	-01	13	$\boxed{55}$	40
28	20	13	11	$\boxed{32}$	28

Factor Correlations

COG	100			
SOC	07	100		
PHY	19	31	100	
GEN	32	35	33	100

Note. Cog = Cognitive; Soc = social; Phy = Physical; Gen = General. The numbers refer to the numbering on the actual instrument. All parameters are presented without decimal points. Factor loadings in boxes are the loadings of item-pairs designed to measure each factor (target loadings).

TABLE 3

MTMM Matrix of Correlations Between Responses to Two self-concept instruments (SDQ and PCS), an academic Motivation measure (SDI), and academic achievement measures in Reading (RAch) and Mathematics (MAch).

	PCS				SDQ[a]				SDQ[b]					SDI[c]	Achievement[c]	
	Phy	Soc	Gen	Cog	Phy	Per	Gen	TAcd	Sch	Red	Mth	Apr	Prt	AMot	RAch	Mach
PCS																
Phy	(82)															
Soc	46	(83)														
Gen	52	50	(80)													
Cog	33	15	51	(79)												
SDQ[a]																
Phy	67*	34	36	18	(87)											
Per	41	74*	45	07	46	(89)										
Gen	48	38	57*	35	55	66	(86)									
TAcd	18	07	35	60*	33	26	45	(93)								
SDQ[b]																
Sch	16	08	34	54	33	26	43	94	(89)							
Red	14	01	22	46	21	15	31	72	43	(94)						
Mth	19	12	28	40	23	27	32	55	62	16	(93)					
Apr	41	29	50	22	53	48	64	29	30	14	18	(91)				
Prt	14	23	37	17	25	31	40	33	33	12	19	19	(89)			
SDI[c]																
AMot	08	01	26	35	13	11	21	48	48	28	36	13	17	(75)		
Achievement[c]																
RAch	-08	-06	03	35	-11	-05	01	28	14	43	03	-16	-11	05	(93)	
MAch	05	-04	19	40	-03	-04	08	26	26	15	31	-05	-01	05	47	(88)

Note. Phy=physical; Soc = Social; Gen=General; Cog = Cognitive; Per = Peer Relations; Acd= Total Academic (sum of Sch, Red, Mth); Sch = School; Red = Reading; Mth = Math; Apr = Physical Appearance; Prt = Parent Relations; AMot = Achievement Motivation; RAch = Reading Achievement; MAch = Mathematics achievement. Coefficient alpha estimates of reliability appear in parenthesis. All correlations, presented without decimal points, greater than .08 and .11 are statistically significant at $p < .05$ and $p < .01$ respectively.

a -- SDQ scores posited to match the four PCS scores that are the basis of the MTMM analysis.

b -- The remaining SDQ scores not included in the MTMM analysis.

c -- Because motivation and achievement scores are academic constructs they are not considered in the MTMM analysis. These scores should, however, be more highly correlated with the corresponding academic self-concept factors than the non-academic self-concept factors.

* correlations between scores from different instruments representing the same content domain, the convergent validities in the MTMM analysis.

TABLE 4

Convergent Validity Coefficients For 7th, 8th and 9th grade students.

Correlations Between	Year in School 7th n=154	8th n=169	9th n=185	Total N=508
PCS Physical and SDQ Physical	.61	.67	.75	.67
PCS Social and SDQ Peers	.69	.82	.70	.74
PCS General and SDQ General	.55	.54	.64	.57
PCS Cognitive and SDQ Total Academic	.51	.58	.65	.60
PCS Cognitive and Reading Achievement	.21	.43	.37	.35
PCS Cognitive and Math Achievement	.34	.46	.39	.40
SDQ Reading and Reading Achievement	.33	.48	.47	.43
SDQ Math and Math Achievement	.27	.31	.35	.31

Note. All correlations are statistically significant at $p < .05$.

TABLE 5

Factor Analysis of Responses to the Perceived Control (CPC) Scale

CPC subscale	U	I	P	PHY	communality
	Factor Loading Matrix				
PHY US	55	06	01	-24	40
PHY PS	28	00	23	-30	31
PHY IS	00	25	-06	45	29
SOC US	62	-01	-09	-05	36
SOC PS	10	-01	50	-04	30
SOC IS	04	33	-05	19	15
GEN US	57	14	07	-10	40
GEN PS	-03	13	57	-10	34
GEN IS	-07	03	10	28	10
COG US	56	-14	07	-01	38
COG PS	08	-10	56	16	38
COG IS	01	51	-26	07	32
PHY UF	56	-04	05	19	35
PHY PF	25	07	18	-16	18
PHY IF	-06	33	18	08	16
SOC UF	62	10	02	-12	43
SOC PF	13	-22	48	17	35
SOC IF	00	33	10	06	13
GEN UF	65	00	-01	02	41
GEN PF	04	14	57	03	38
GEN IF	06	64	08	-12	43
COG UF	65	-17	09	30	52
COG PF	00	01	35	-02	12
COG IF	-05	67	00	-08	46

Factor Correlations

Unknown	100			
Internal	-07	100		
Powerful	42	06	100	
Physical	-19	11	03	100

Note. Each of the 24 subscales is identified by three values denoting: content domain (Cog = Cognitive; Soc = social, Phy = Physical, and Gen = General); cause (U=unknown, P=powerful others, and I=internal); and outcome (S=Success and F=Failure). All coefficients are presented without decimal points.

TABLE 6

Correlations Among the 12 Perceived Control (CPC) Scales from Connell's (1984) Junior High School sample (above the main diagonal) and the present study (below main diagonal)

	PHYSICAL			SOCIAL			GENERAL			COGNITIVE		
	PU	PP	PI	SU	SP	SI	GU	GP	GI	CU	CP	CI
PHYSICAL												
PU	(59)	16	NS[a]	26*	25	NS	46*	NS	NS	53*	18	NS
PP	36	(66)	NS	25	28*	NS	16	24*	NS	16	24*	NS
PI	-03	-07	(63)	22	12	NS*	NS	19	NS*	NS	28	NS*
SOCIAL												
SU	45*	37	-18	(56)	23	-15	45*	19	NS	30*	24	-24
SP	09	20*	-07	23	(64)	NS	27	29*	12	32	38*	NS
SI	-15	-12	10*	-07	-12	(57)	NS	17	25*	-17	22	20*
GENERAL												
GU	54*	24	-07	55*	12	-01	(62)	25	NS	43*	20	NS
GP	12	27*	03	17	41*	-07	14	(59)	12	NS	26*	NS
GI	11	04	17*	-03	-02	12*	-11	03	(39)	NS	NS	25*
COGNITIVE												
GU	50*	28	-12	47*	19	-13	50*	17	-09	(66)	25	NS
GP	07	22*	07	20	32*	07	18	31*	08	17	(66)	12
GI	-03	01	21*	-04	-16	31*	-01	-13	24*	-25	-07	(62)

Note. Each CPC scale is represented by two letters that refer to the content domain (P=physical; S=social; G=general; C=cognitive) and cause (U=unknown, P=powerful others, I=internal). The values in parentheses are coefficient alpha estimates of reliability from the present investigation. All correlations, presented without decimal points. For the present investigation, correlations greater than .08 and .11 are statistically significant at $p < .05$ and $p < .01$ respectively.

* Correlations between scales in which the cause is the same but the content domain is different. Correlations in which the content domain is the same but the cause is different are contained in the rectangular submatrices in which the coefficient alphas (values in parenthesis) form the main diagonal.

a -- Connell (1984) did not present coefficients that were not statistically significant.

TABLE 7

Correlations Between Perceived Control (CPC) Scores and the Self-concept (PCS and SDQ), Academic Motivation (SDI), and academic achievement measures

CPC	PCS				SDQ				SDQ					SDI	Achieve	
	Phy	Soc	Gen	Cog	Phy	Per	Gen	TAcd	Sch	Red	Mth	Apr	Prt	Motv	RAch	Mach
TOTAL scores (averaged across content domains)																
Cause x Outcome (success) Scores																
.US	-31	-25	-34	-28	-21	-22	-30	-26	-20	-26	-14	-20	-11	-19	-18	-18
.PS	-20	-22	-29	-13	-11	-17	-16	-11	-10	-11	-07	-06	-11	-23	-09	-02
.IS	36	24	32	25	34	27	32	23	20	19	12	24	20	16	01	05
Cause x Outcome (failure) Scores																
.SF	-20	-27	-20	-14	-07	-16	-14	-09	-04	-14	-07	-07	-07	-21	-11	-08
.PF	-25	-23	-22	-14	-09	-15	-13	-07	-05	-09	-10	-01	-10	-21	-08	-07
.IF	05	05	-06	06	-02	01	-02	05	-04	06	02	-14	01	-06	07	10
Cause Scores (averaged across outcome)																
.S.	-28	-28	-30	-23	-16	-21	-25	-19	-14	-22	-12	-16	-10	-21	-16	-15
.P.	-26	-22	-30	-15	-11	-18	-16	-11	-09	-12	-09	-04	-12	-24	-10	-05
.I.	23	16	12	18	16	15	15	15	13	14	08	03	11	04	06	10
Internal/external Scores (averaged across cause and outcome)																
.RS	36	31	40	23	29	30	31	22	19	19	12	18	20	28	07	04
.RF	22	21	11	14	06	12	08	10	07	11	10	-10	09	10	11	13
.R.	35	31	31	23	21	25	24	19	16	18	13	06	18	23	10	13
Augmented Internal/external Scores (averaged across cause and outcome)																
..S	43	33	45	31	35	33	40	28	23	27	16	26	21	26	13	13
..F	19	22	13	16	05	13	09	12	09	15	09	-08	10	12	15	15
...	37	32	35	27	24	27	29	24	19	24	14	11	19	22	16	16
PHYSICAL Domain																
Cause x Outcome (success) Scores																
PUS	-40*	-21	-27	-13	-30*	-22	-27	-16	-11	-21	-08	-24	-09	-12	-06	-10
PPS	-38*	-25	-21	-08	-30*	-28	-30	-10	-10	-07	-09	-19	-10	-07	02	-02
PIS	46*	20	24	14	47*	25	30	14	16	06	16	18	15	08	-03	01
Cause x Outcome (failure) Scores																
PUF	-09*	-10	-10	-09	04*	-04	-03	-05	01	-17	03	00	-05	-12	-11	-03
PPF	-19*	-17	-11	01	-12*	-14	-12	00	00	01	03	-09	-09	-11	03	01
PIF	06*	07	00	08	07*	04	04	05	08	-01	07	-04	01	-02	03	03
Cause Scores																
PU.	-31*	-19	-23	-13	-17*	-16	-19	-13	-06	-23	-04	-16	-09	-14	-10	-08
PP.	-34*	-26	-20	-04	-26*	-25	-25	-06	-06	-04	-03	-17	-11	-11	03	00
PI.	30*	16	13	13	30*	16	19	12	14	01	13	06	09	02	00	03
Internal/external Scores																
PRS	53*	29	29	14	49*	33	38	15	16	08	15	23	16	10	-03	02
PRF	18*	17	07	05	13*	13	11	05	06	-01	04	02	06	06	00	02
Augmented Internal/external Scores																
P.S	57*	30	32	16	52*	34	40	19	18	14	16	28	17	12	00	05
P.F	15*	16	08	09	09*	10	09	07	07	04	04	12	18	21	18	11
SOCIAL Domain																
Cause x Outcome (success) Scores																
SUS	-15	-24*	-16	-16	-05	-15*	-16	-12	-08	-15	-12	-02	-13	-16	-15	-10
SPS	-12	-24*	-26	-12	-07	-15*	-09	-09	-06	-12	-03	-06	-07	-20	-07	01
SIS	19	12*	23	20	13	14*	15	12	09	13	03	10	13	09	11	10
Cause x Outcome (failure) Scores																
SUF	-21	-31*	-28	-12	-16	-26*	-24	-11	-11	-07	-14	-22	-10	-13	04	-05
SPF	-06	-17*	-12	-08	-09	-08*	-03	-02	-01	-08	-01	11	-04	-08	-17	-12
SIF	-01	04*	-06	-04	-05	-01*	-07	-05	-06	-02	-04	-07	-02	-07	-05	-02
Cause Scores																
SU.	-21	-32*	-25	-15	-12	-24*	-23	-14	-12	-12	-16	-14	-13	-16	-07	-10
SP.	-12	-26*	-25	-13	00	-14*	-08	-08	-03	-13	-03	02	-08	-18	-14	-06
SI.	11	10*	10	09	05	08*	05	04	02	07	-01	01	07	01	03	05
Internal/external scores																
SRS	21	26*	34	22	14	20*	16	15	10	18	04	11	14	21	13	05
SRF	03	14*	04	03	-09	05*	-03	-02	-05	04	-04	-13	02	01	07	07
Augmented Internal/external scores																
S.S	26	29*	35	26	15	23*	22	18	13	22	08	12	18	22	18	11
S.F	09	21*	11	04	00	13*	05	02	00	05	03	00	04	03	01	06

Table 7 continued on next page

TABLE 7 (continued)

CPC	PCS				SDQ								SDI	Achieve		
	Phy	Soc	Gen	Cog	Phy	Per	Gen	Sch	Red	Mth	Apr	Prt	Motv	RAch	Mach	
GENERAL Domain																
Cause x Outcome (success) Scores																
GUS	-20	-18	-28§	-19	-14	-14	-23§	-16	-14	-14	-05	-19	-06	-14	-08	-07
GPS	-13	-13	-17§	-03	-07	-08	-06§	00	03	-05	-04	-03	-02	-19	-01	02
GIS	07	11	20§	14	14	18	23§	15	13	12	08	24	11	13	-11	-02
Cause x Outcome (failure) Scores																
GUF	-21	-23	-19§	-13	-07	-12	-12§	-08	-05	-09	-10	-08	-07	-21	-07	-07
GPF	-07	-14	-20§	-09	-02	-06	-01§	-02	-01	-02	-06	02	-05	-23	-09	-06
GIF	01	-01	-10§	05	-09	-04	-05§	-01	-02	01	-03	-18	-02	-09	07	11
Cause Scores																
GU.	-24	-25	-28§	-19	-13	-16	-21§	-15	-12	-14	-09	-17	-08	-21	-09	-08
GP.	-11	-15	-21§	-07	-03	-08	-04§	-01	01	-04	-05	-01	-04	-23	-05	-03
GI.	06	07	08§	13	04	11	14§	10	07	09	04	06	06	04	-04	06
Internal/external scores																
GRS	14	17	26§	12	15	18	20§	11	08	12	09	19	10	23	-07	-02
GRF	07	11	09§	11	-07	03	-02§	01	00	03	03	-14	03	11	13	14
Augmented Internal/external scores																
G.S	18	20	33§	19	19	22	29§	17	14	16	10	27	12	22	-05	01
G.F	13	16	09§	13	-04	06	02§	04	02	06	06	-11	04	12	13	16
COGNITIVE Domain																
Cause x Outcome (success) Scores																
CUS	-15	-08	-26	-35§	-12	-12	-21	-29§	-25	-27	-15	-12	-05	-14§	-27§	-27§
CPS	-01	-01	-13	-08§	04	-01	-06	-06§	-05	-06	-04	06	-07	-15§	-13§	-06§
CIS	12	10	10	13§	00	03	03	14§	10	15	00	-03	10	06§	17§	12§
Cause x Outcome (failure) Scores																
CUF	-06	-13	-05	-08§	-02	-05	-01	-02§	03	-11	02	08	00	-14§	-14§	-10§
CPF	-16	-05	-16	-18§	-08	-04	-08	-20§	-19	-13	-20	-01	-14	-11§	-03§	-07§
CIF	04	01	-03	08§	00	01	01	13§	07	18	01	-13	06	01§	18§	14§
Cause Scores																
CU.	-12	-13	-19	-25§	-07	-10	-14	-19§	-14	-22	-08	-03	-04	-17§	-25§	-22§
CP.	-11	-04	-18	-16§	-03	-03	-08	-16§	-16	-11	-15	03	-14	-15§	-09§	-08§
CI.	09	06	03	12§	00	02	03	15§	09	20	00	-11	09	03§	21§	16§
Internal/external Scores																
CRS	07	06	16	13§	-04	02	06	12§	09	13	04	-06	10	15§	19§	11§
CRF	16	05	12	20§	07	04	08	01§	20	22	18	-07	16	09§	13§	14§
Augmented Internal/external Scores																
C.S	14	10	23	26§	03	07	14	24§	19	24	09	01	11	16§	28§	22§
C.F	13	09	07	18§	04	05	06	20§	13	24	10	-12	12	11§	19§	17§

Note. See note in Table 3 for definitions of PCS, SDQ, SDI, and achievement scores used as criterion variables in this analysis. Each CPC score represents a combination of the instrument's three facets: content domain (P = physical, S = social, G = general, and C = cognitive), cause (U = unknown, P = powerful others, and I = internal) and outcome (S = success and F = Failure) (e.g., SIS = Social/Internal/Success). A dot indicates that the score has been averaged across all levels of that facet (e.g., SI. = (SIF + SIS)/2). Whenever R appears as the cause, the score represents the difference between internal and external (powerful other) responses (e.g., SRS = SIS - SPS) and are referred to as internal/external scores. Scores averaged across the three causes scores were obtained by subtracting the powerful others and unknown scales from two times the internal scale (e.g., S.S = 2 x SIS - SPS - SUS) and are referred to augmented internal/external scores. All correlations, presented without decimal points, greater than .08 and .11 are statistically significant at $p < .05$ and $p < .01$ respectively.

§ correlations between CPC scores and their corresponding criterion measures that are analogous to the convergent validities.